
Total Maximum Daily Load Project: Basin Groups D & E Dissolved Oxygen and Bacteria Impairments

Event-Based Monitoring Plan

October 2004 through August 31, 2005

Submitted by

Texas Engineering Experiment Station

Conrad Blucher Institute

Under Interagency Agreement # 582-4-58897, Amendment 2

Submitted to

Texas Commission on Environmental Quality

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Overall Project Description

The Texas Engineering Experiment Station (TEES) represented by the Conrad Blucher Institute for Surveying and Science (CBI) is leading an effort sponsored by the Texas Commission on Environmental Quality (TCEQ) to support the development of Total Maximum Daily Loads (TMDLs) for three segments in Basin Groups D & E (Segments 1803A, 1803B, and 2107 see Figure 1). The segments are impaired due levels of dissolved oxygen or bacteria or both in exceedance of established water quality standards. Water quality assessments of these streams during the duration of this Monitoring Plan will occur during storm events and kinetics studies will occur during low flow conditions. A storm event is defined for the Monitoring Plan as a rainfall event significant enough to create runoff into the study segments. All data collection performed under this Monitoring Plan will be in support of modeling efforts by the CBI project team.

Sample Design Rationale

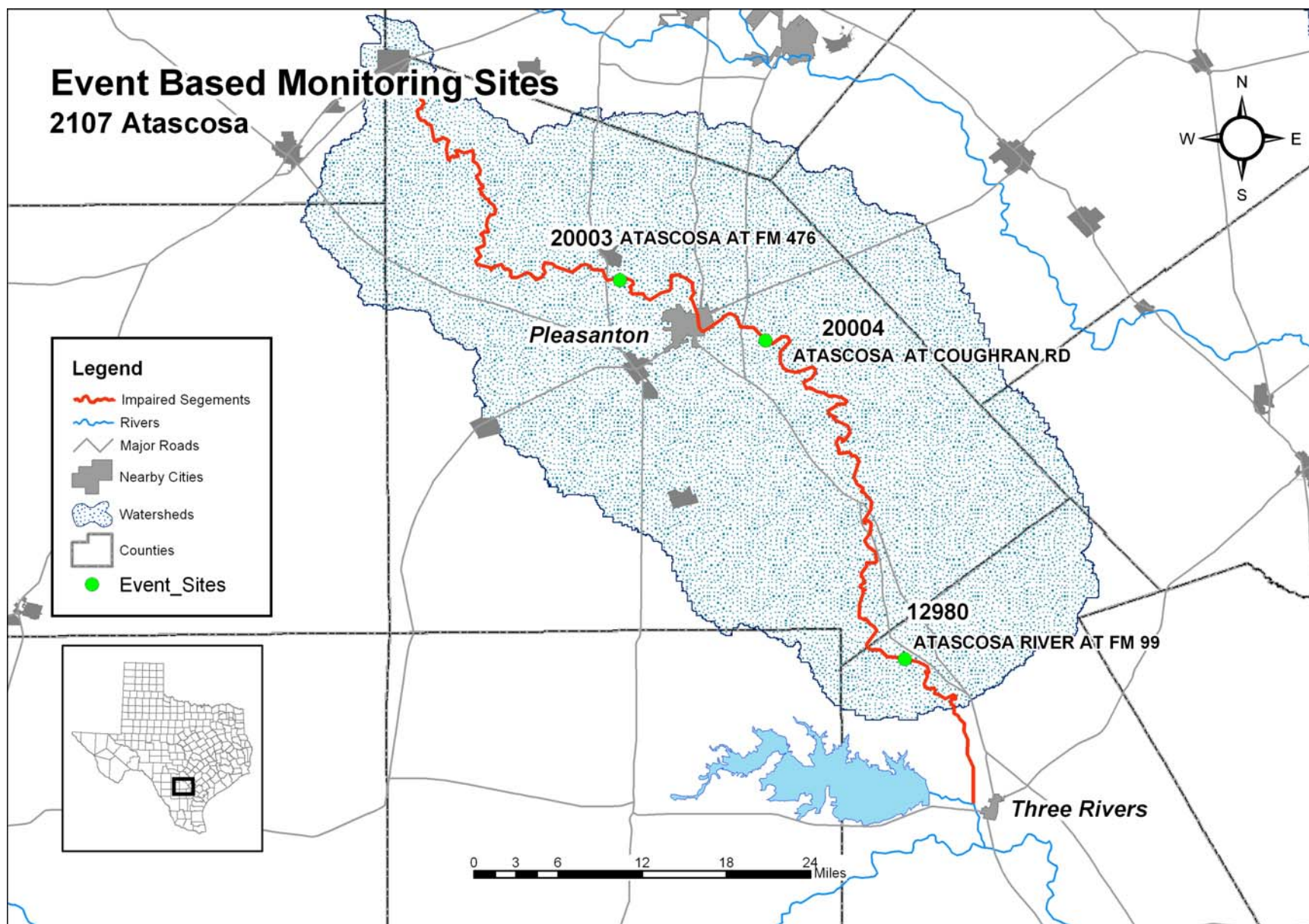
This Event-Based Monitoring Plan provides the additional water quality data and information identified in the Historical Data Review (Task 3, Work Order Number 582-2-44842-1) impairment verification phases of the project as necessary to meet the project objectives. The data collected and assessed for this project will include physical, chemical, hydrological data, time of travel, bacterial source tracking, and stream cross sections. The collection of these data will be coordinated with the appropriate River Authority and TCEQ Region Offices. Three separate storm events will be sampled for each segment over the duration of this Monitoring Plan. Water quality sampling will occur every 8 hours during each of these events. Data collected under this Monitoring Plan will be used in the modeling of these segments for DO, bacteria, or both. The Monitoring Plan is prepared in accordance with the guidelines established by TCEQ in the Surface Water Quality Monitoring Procedures Manual, TCEQ publication RG-415. The Monitoring Plan identifies the monitoring locations, the monitoring frequency, and the criteria for monitoring and data collection. The Monitoring Plan also identifies the type of samples that will be collected, the methods used to gather all data, and the parameters that will be analyzed. Location of the monitoring stations has been determined using Global Positioning System (GPS) coordinates. The Monitoring Plan lists in detail the equipment and supplies necessary to carry out the monitoring effort. Station identification numbers have been requested from TCEQ for stations without them.

This Monitoring Plan will be subject to TCEQ revision again at any time during the duration of this contract.

Monitoring Stations

Stations were selected based on several criteria established for the monitoring events. Existing stations are used wherever possible, especially those identified by the Historical Data Review and impairment verification as having exceedences. Other criteria for station selection include: probability of having flow during the sampling period, accessibility during a storm event, and representative distribution of stations along segment. Because of these criteria, not all stations identified in the Historical Data Review as having exceedences for DO or pathogens are included in the set of stations for this Monitoring Plan.

For each of the impaired segments to be monitored, a GIS-generated map format is provided that shows the “303 (d)”-listed segment, the location of existing TCEQ monitoring stations that will be used in this monitoring project and USGS gauge stations. The TCEQ-GIS file titled “Impaired Water Bodies – 1999 303 (d) List” was used to generate the maps of each segment. For each segment, there is an associated table of monitoring stations that follows the format of TCEQ’s Coordinated Monitoring Schedule, FY2002. The table provides frequency details for each monitoring station.



Segment 2107 Atascosa River

Three stations have been chosen for sampling for pathogen impairment.

Station: 12980 Located at Atascosa River at FM 99 bridge west of Whitsett, TX.

Station: 20004 New Station Located Atascosa at Coughran Road 0.4 miles north of Coughran.

Station: 20003 New Station Located Atascosa River at FM 467.

Table 2 lists the sampling parameters and frequency (following the format of TCEQ's Coordinated Monitoring Schedule, FY2002).

2107 Atascosa River									
Description	Station ID	SC1	SC2	Program Code	Storm Event Monitoring	Bacterial Source Tracking	Stream Cross Section	Time of Travel	
ATASCOSA RIVER AT FM 99	12980	CB	CB	TN	3	4	1	1	
ATASCOSA RIVER AT COUGHRAN RD	20004	CB	CB	TN	3	4	1	1	
ATASCOSA RIVER AT FM 467	20003	CB	CB	TN	3	4	1	1	

Table 2

Field Sampling Procedures

CBI will follow the field sampling procedures for field and conventional chemical parameters documented in the Surface Water Quality Monitoring Procedures Manual (SWQM) (TCEQ 2003). Water quality sampling will only occur during a documented storm event for the segment. Storm events for each of the three segments was determined based on historical flow data. Time of travel studies occur during baseflow conditions.

Personnel

This project will operate one to two field teams during the monitoring period. All teams will have a minimum of two personnel, but three or more are planned. Each team will be lead by an experienced Field Team Leader.

Schedule

Storm event monitoring will include sampling of a network of spatially distributed stations. These surveys will be mounted in response to significant rainfall in the project area. Rainfall must be sufficient to produce runoff in the study segments. Generally, it is anticipated that rainfall on the order of 1.0 inch will be necessary to produce the required runoff condition. Field crews will keep track of local weather forecasts during preparation for sampling. Time of travel studies, stream cross sections, and bacterial source tracking will be initiated under baseflow conditions.

Flow

Flow velocity measurements will be performed using an RD Instruments 1200-KHz Rio Grande River Discharge Measurement System. The Acoustic Doppler Current Profiler (ADCP) is an electronic instrument developed and Manufactured by RD Instruments of San Diego, California that is used to measure water velocities. The instrument transmits acoustic signals into the water column. When the frequency of the transmitted signals is compared with the frequency of backscatter signals reflected off particles in the water, the velocity of the particles and, hence, the water, can be calculated. ADCPs have been widely used by oceanographers to measure currents in the deep-sea environment. More recently, the technology has been adapted to the riverine and estuarine environment and is now a standard tool used by the USGS for streamflow discharge measurements. The primary advantages of mCBing discharge measurements using the ADCP compared with a Price or other point-current meter are that (1) the time required to complete a measurement is reduced; (2) data can be collected throughout the water column and cross section rather than at discrete points; (3) taglines or other stationing devices are unnecessary because the instrument keeps track of distance traveled, provided the bed is stable; and (4) the instrument can be boat/flotation-mounted, facilitating accurate measurements and safety in deep and/or fast flowing water. The ADCP will be deployed during the storm event in an Ocean Science Riverboat. This boat will be towed safely from land during

the event. Data will be sent real time via radio to a laptop located on-site. Use of the ADCP is fully detailed in the Field SOP for this project. The procedures for the ADCP are based on the manufacturer's User's Guide (RDI 2001) and the "Quality Assurance Plan for Discharge Measurements Using Broadband Acoustic Doppler Current Profilers" developed by the USGS (Lipscomb 1995). The measurements produced by the ADCP will be recorded in a manner consistent with the streamflow measurement form shown in Table B-3 of the RWA manual.

Chemical Water Quality

Water samples will be collected at each station every 8 hours during a storm event for DO/pathogen/flow sampling. Appropriate volumes of water (typically four liters per station) will be collected, preserved on ice, transported and analyzed in accordance with SWQM procedures (TCEQ 2003). Analytes include total alkalinity, ammonia, chloride, chlorophyll-A, nitrate + nitrite nitrogen, phenophytin-a, orthophosphate-phosphorous, total phosphorous, sulfate, TKN, TOC, TSS, TDS, CBOD and e-coli.

Physicochemical Water Quality

Physicochemical parameters will be measured during each of the monitoring events using multiprobe equipment, either a YSI 600XLM or a Hydrolab Multiprobe Recorder. Physicochemical parameters include DO, water temperature, pH, and specific conductance.

Time of Travel Studies

A simple time of travel study will be performed on each of the segments. Rhodamine dye will be injected into the stream above the study reach to insure proper mixing of the dye. Within the reach, sampling sites will be selected for monitoring the leading edge, maximum concentration, and trailing edge of the dye cloud. Equipment used for this monitoring will be a Wet Labs ECO Triplet Fluorometer, CBI Data-logger, and an ADCP for measurement of flow at each sampling site. Time of travel studies will be initiated during ambient flow conditions.

Stream Cross Section

Cross-sections of the streambed for the segment will be taken at each storm event sampling point during low flow conditions. Benchmarks will be established at each end of the transect using a differentially corrected GPS. The cross-section will then be measured using a total station.

Bacterial Source Tracking

Bacterial Source Tracking is another type of specialized monitoring that will be applied in the current monitoring plan. Bacterial Source Tracking (BST) will be utilized in specific segments to provide an advanced degree of specificity regarding the identification of sources of bacterial indicators. BST results would be expected to provide a substantial benefit to water quality modeling efforts, in that emphasis could be placed upon the specific sources identified. Samples will be collected during storm event samples that will be prepared for bacterial DNA analysis. A DNA library of possible sources of bacterial contamination to the segment will be developed for comparison.

Pictorial Record

Digital photographs will be taken at each station using a digital camera during each survey. Digital photographs will be taken upstream, downstream, and at each transect at which a physical habitat assessment occurs. These photographs will be compiled with a legend describing date, time and location and stored on the CBI computer server.

Anecdotal Record

The anecdotal record will be a written log of observations made at each station. This record will describe the physical stream characteristics noted by CBI field personnel and kept in field data logbooks. This record will be used to track the hydrological conditions of each segment throughout the study periods. All anecdotal field notes, other than data recorded on the TCEQ data sheets found in the RWA manual, will be recorded in field data logbooks. These data will include, but not be limited to, date, time, station number, stream type, water appearance, presence of pools during no flow conditions, stream uses, riparian condition, biological activity, weather conditions, odors, watershed activity (land use), sample information and missing parameters, where applicable.

Literature Cited

Lipscomb, S.W. 1995. *Quality Assurance Plan for Discharge Measurements Using Broadband Acoustic Doppler Current Profilers*. U.S. Geological Survey. Open-File Report 95-701.

RDI. 2001. *WinRiver User's Guide*. RD Instruments, Inc. P/N 957-6171-00 (June 2001).

TCEQ. 2003. *Surface Water Quality Procedures Manual*. GI-252, December 2003.

TCEQ. 1999b. *Receiving Water Assessment Procedures Manual*. GI-253, June 1999.